

Our ref: INA-44

Client's ref: ST/SWE-G-144-ge

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of: Erwin HARTMANN, et al: Art Unit:

Serial No. : to be assigned : Examiner:

Filed : concurrently herewith :

Title : SEAL WITH NON-CONTACT ADJACENT
DEFLECTOR RINGS : Dated: April 19, 2006

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PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

S i r:

Attached are Amended Claims, Replacement Sheets 2 and 3 of
the drawings, and the Remarks.

AMENDED CLAIMS

1. (currently amended) A seal ~~(1, 34, 45)~~ with comprising deflector rings ~~(2, 3, 35, 36, 46, 47)~~ which are arranged concentrically with respect to one another about a common axis of rotation ~~(6)~~ and without contact with one another, at least two radial fins ~~(11, 12, 13, 48)~~, which are axially adjacent to one another, being formed at a first deflector ring ~~(2, 35, 46)~~ of the deflector rings, and the radial fins ~~(11, 12, 13, 48)~~ being arranged without contact with a second deflector ring ~~(3, 36, 47)~~ of the deflector rings wherein ~~(2, 3, 35, 36, 46, 47)~~, ~~characterized in that~~ an annular first cavity ~~(19, 23)~~ is formed at least between two of the radial fins ~~(11, 12, 13, 48)~~ which are axially adjacent to one another and the second deflector ring ~~(3, 36, 47)~~, the radial fins ~~(11, 12, 13, 48)~~, axially separated from one another by the first cavity ~~(19, 23)~~, being positioned freely opposite one another at the cavity ~~(19, 23)~~, and the first cavity ~~(19, 23)~~ being delimited in one radial direction by the second deflector ring ~~(3, 36, 47)~~, which adjoins the radial fins ~~(11, 12, 13, 48)~~, and in an opposite radial direction by the first deflector ring ~~(2, 35, 46)~~.

2. (currently amended) The seal as claimed in claim 1, wherein ~~characterized in that~~ the second deflector ring ~~(3, 36, 47)~~ at least partially surrounds the first deflector ring ~~(2, 35, 46)~~ on the radially outer side, the first deflector ring ~~(2, 35, 46)~~

being rotatable relative to the second deflector ring ~~(3, 36, 47)~~ about the axis of rotation ~~(6)~~.

3. (currently amended) The seal as claimed in claim 2, wherein ~~characterized in that~~ the largest clear radial distance at least in the first cavity ~~(19)~~ between the first deflector ring ~~(2, 35, 46)~~ and the second deflector ring ~~(3, 36, 47)~~ corresponds to at least 1.4 times the maximum axial distance between the radial fins ~~(11, 12)~~.

4. (currently amended) The seal as claimed in claim 2, wherein ~~characterized in that~~ a first radial fin ~~(11, 48)~~, which is arranged furthest axially outward at the seal ~~(1, 34, 45)~~ and at least partially closes off the seal ~~(1, 34, 45)~~ with respect to an environment ~~(16)~~ surrounding the seal in the axial direction is radially longer than a second radial fin ~~(12)~~, which lies axially opposite the first radial fin ~~(11, 48)~~ at the cavity ~~(19)~~.

5. (currently amended) The seal as claimed in claim 4, wherein ~~characterized in that~~ the radial distance between an inner lateral surface ~~(21)~~, facing the first deflector ring ~~(2, 35, 46)~~, of the second deflector ring ~~(3, 36, 47)~~ and the axis of rotation ~~(6)~~ increases as the axial proximity to the surrounding environment ~~(16)~~ decreases, the inner lateral surface ~~(21)~~ at least partially engaging radially around the radial fins ~~(11, 12, 13, 48)~~ and the first cavity ~~(19)~~.

6. (currently amended) The seal as claimed in claim 2,

wherein ~~characterized in that~~ at least one of the radial fins ~~(11, 48)~~, located axially closest to an environment ~~(16)~~ surrounding the seal ~~(1, 34, 45)~~, of two of the radial fins ~~(11, 12, 48)~~ delimiting the first cavity ~~(19)~~ in each case has an annular surface ~~(29)~~ which faces the first cavity ~~(19)~~ and an adjacent radial fin ~~(12)~~ and is inclined with respect to the axis of rotation ~~(6)~~, the axial distance in the cavity ~~(19)~~ between the annular surface ~~(29)~~ and between the axially opposite, adjacent radial fin ~~(12)~~ increasing with increasing radial distance to the second deflector ring ~~(3, 36, 47)~~.

7. (currently amended) The seal as claimed in claim 6, wherein ~~characterized in that~~ the annular surface ~~(29)~~ is inclined at an angle of from 70° to 85° with respect to the axis of rotation ~~(6)~~.

8. (currently amended) The seal as claimed in claim 2, wherein ~~characterized in that~~ the first cavity ~~(19)~~ merges axially into a radial first annular gap ~~(18, 50)~~ between the first radial fin ~~(11, 48)~~ and the second deflector ring ~~(3, 47)~~ and into a radial second annular gap ~~(22)~~ between the second radial fin ~~(12)~~ and the second deflector ring ~~(3, 47)~~.

9. (currently amended) The seal as claimed in claim 8, wherein ~~characterized in that~~ the first annular gap ~~(18)~~, on an axially outer side of the first radial fin ~~(11)~~ between the first deflector ring ~~(2)~~ and the second deflector ring ~~(3)~~ opens out

freely into an environment ~~(16)~~ axially surrounding the seal ~~(1,~~
~~34)~~.

10. (currently amended) The seal as claimed in claim 8,
wherein ~~characterized in that~~ the first annular gap ~~(18)~~ is
radially narrower than the second annular gap ~~(22)~~.

11. (currently amended) The seal as claimed in claim 8,
wherein ~~characterized in that~~ the second annular gap ~~(22)~~ runs
radially closer to the axis of rotation ~~(6)~~ than the first annular
gap ~~(18)~~.

12. (currently amended) The seal as claimed in claim 8,
wherein ~~characterized in that~~ the first annular gap ~~(50)~~ opens out
axially into a radial first collection channel ~~(51)~~, which runs
around the axis of rotation ~~(6)~~, in the second deflector ring ~~(47)~~,
and the first collection channel ~~(51)~~ is open toward the
environment ~~(16)~~ axially surrounding the seal ~~(45)~~.

13. (currently amended) The seal as claimed in claim 8,
wherein ~~characterized in that~~ the second annular gap ~~(22)~~ opens out
into a second cavity ~~(23)~~, the second cavity ~~(23)~~, which is annular
in form, being at least partially enclosed by the first deflector
ring ~~(2, 35, 46)~~ and the second deflector ring ~~(3, 36, 47)~~.

14. (currently amended) The seal as claimed in claim 13,
wherein ~~characterized in that~~ the second radial fin ~~(12)~~ and a
third radial fin ~~(13)~~, at the first deflector ring ~~(2, 35, 46)~~, lie
freely axially opposite one another, separated from one another by

the second cavity ~~(23)~~.

15. (currently amended) The seal as claimed in claim 14, wherein ~~characterized in that~~ the second cavity ~~(23)~~ merges axially into the radial second annular gap ~~(22)~~ and into a third annular gap ~~(24)~~ between the third radial fin ~~(13)~~ and the second deflector ring ~~(3, 36, 47)~~.

16. (currently amended) The seal as claimed in claim 15, wherein ~~characterized in that~~ the first annular gap ~~(18)~~ is radially narrower than the second annular gap ~~(22)~~, and in that the second annular gap ~~(22)~~ is radially narrower than the third annular gap ~~(24)~~.

17. (currently amended) The seal as claimed in claim 15, wherein ~~characterized in that~~ the first annular gap ~~(18)~~ is further away from the axis of rotation ~~(6)~~ in the radial direction than the second annular gap ~~(22)~~, and in that the second annular gap ~~(22)~~ is further away from the axis of rotation ~~(6)~~ in the radial direction than the third annular gap ~~(24)~~ at its radially narrowest point.

18. (currently amended) The seal as claimed in claim 15, wherein ~~characterized in that~~ the first radial fin ~~(11, 48)~~ is radially longer than the second radial fin ~~(12)~~, and in that the second radial fin ~~(12)~~ is radially longer than the third radial fin ~~(13)~~.

19. (currently amended) The seal as claimed in claim 15, wherein ~~characterized in that~~ the third annular gap ~~(24)~~, starting

from the second cavity ~~(23)~~, runs initially radially between the third radial fin ~~(13)~~ and the second deflector ring ~~(3, 36, 47)~~ and then runs onward, in the direction of the axis of rotation ~~(6)~~, on a curved path between the third radial fin ~~(13)~~ and the second deflector ring ~~(3, 36, 47)~~, and finally, on a side of the third radial fin ~~(13)~~ which is axially remote from the second radial fin ~~(12)~~, is formed axially between the third radial fin ~~(13)~~ and the second deflector ring ~~(3, 36, 47)~~.

20. (currently amended) The seal as claimed in claim 15, wherein ~~characterized in that~~ the third annular gap ~~(24)~~, starting from the second cavity ~~(23)~~, leads to a third cavity ~~(25, 37, 53)~~ in the seal ~~(1, 34, 45)~~, the third cavity being enclosed at least by the first deflector ring ~~(2, 35, 46)~~ and by the second deflector ring ~~(3, 36, 47)~~.

21. (currently amended) The seal as claimed in claim 15, wherein ~~characterized in that~~ the third annular gap ~~(24)~~ runs out in the radial direction via a second collection channel ~~(26, 38, 51)~~ which runs around the axis of rotation ~~(6)~~, the second collection channel ~~(26, 38, 51)~~ being formed at the second deflector ring ~~(3, 36, 47)~~, and in this arrangement the first deflector ring ~~(2, 35, 46)~~ at least partially projecting axially beyond the second collection channel ~~(26, 38, 51)~~ on the radially outer side.

22. (currently amended) The seal as claimed in claim 1,

wherein ~~characterized in that~~ the second deflector ring (3) at least partially surrounds the first deflector ring (2) on the radially outer side, and in that at least one seal (27) with at least one elastic sealing lip (28) starts from the second deflector ring (3), the sealing lip (28) being radially prestressed against a shaft (4).

23. (currently amended) The seal as claimed in claim 22, wherein ~~characterized in that~~ the sealing lip (28) is arranged axially next to the first deflector ring (2), which is seated on the shaft and delimits the seal on the axially outer side.

24. (currently amended) The seal as claimed in claim 22, wherein ~~characterized in that~~ the sealing lip (28) is at least 2.5 times as long as the sealing lip (28) is thick at the thickest point transversely with respect to this length.

REMARKS

Claims 1-24 are pending and have been amended herein to place them in conventional US format only.

Replacement sheet 2 reference characters 26 and 24 were replaced with reference characters 31 and 27 respectively to correct obvious errors. Additionally, reference characters 32 and 33 were added, while reference character 17 was deleted. Such changes are deemed obvious errors.

Replacement sheet 3 adds reference character 55 to Fig. 3. Such is deemed to be an obvious correction.

Should any extensions of time or fees be necessary in order to maintain this Application in pending condition, appropriate requests are hereby made and authorization is given to debit Account # 02-2275.

Respectfully submitted,

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Encl: 2 sheets of replacement drawings

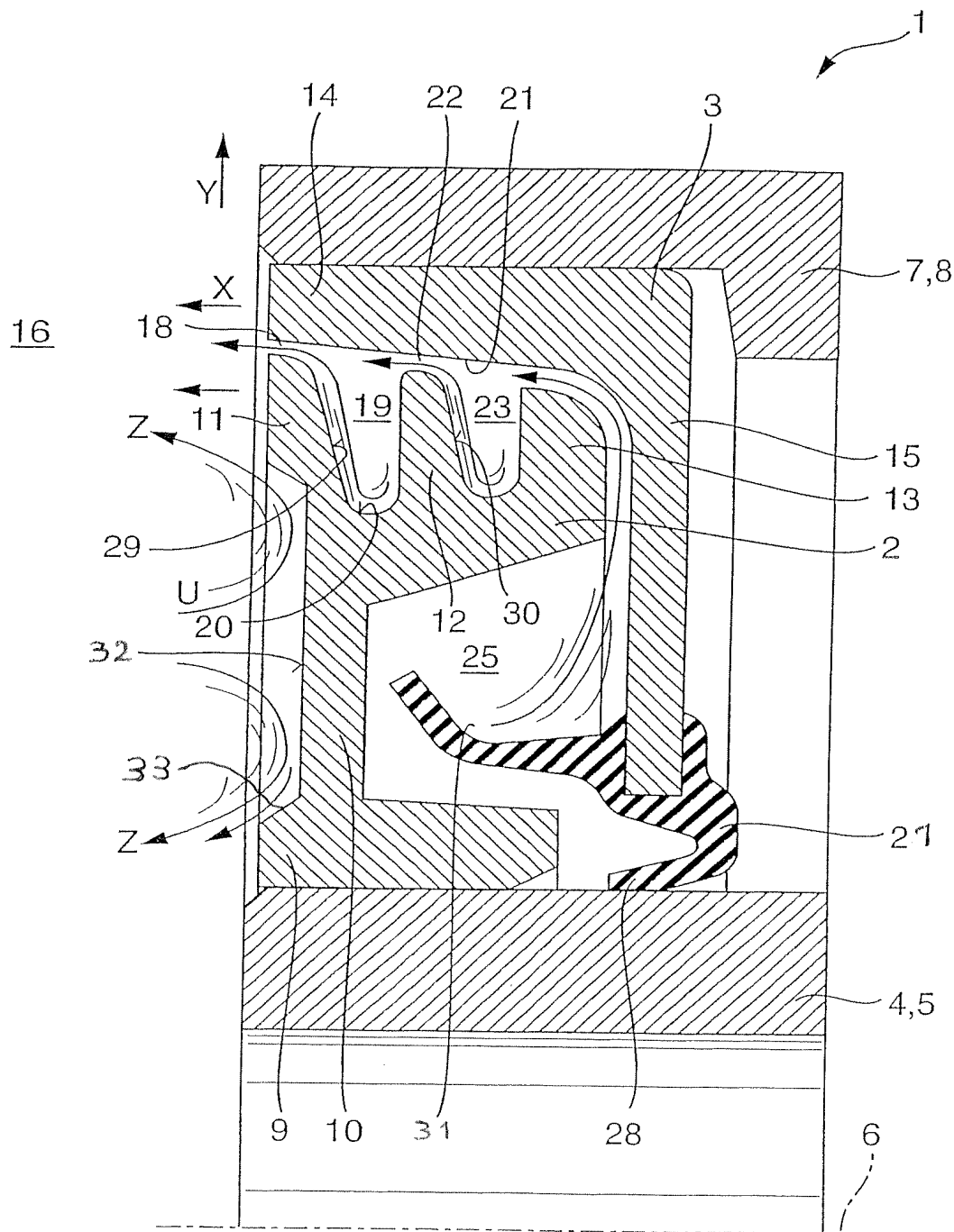


Fig. 1a

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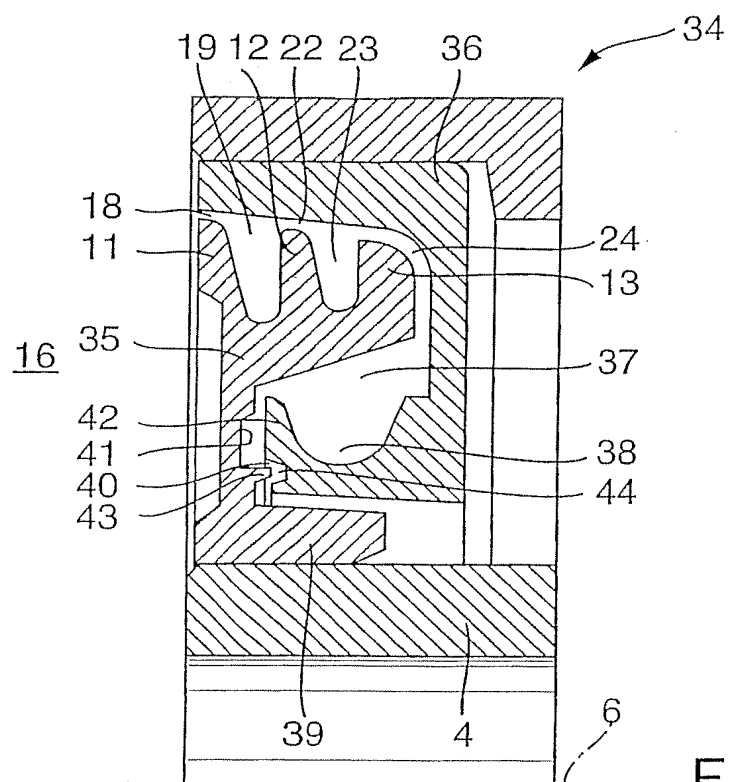


Fig. 2

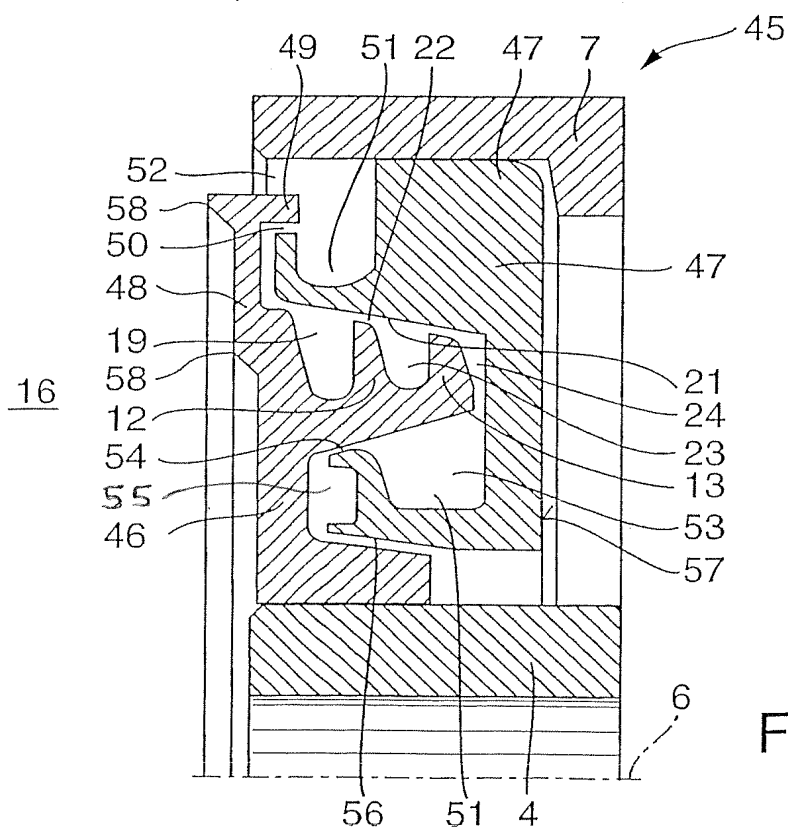


Fig. 3